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[Claim(s)]

[Claim 1] It is the optical semiconductor device characterized by for said wiring having avoided the periphery part on the substrate of said translucency mould object in the optical semiconductor device equipped with a substrate, wiring formed on this substrate, the optical element carried on this wiring, and the translucency mould object which comes to carry out the mould of this optical element and some wiring, and being formed.

[Claim 2] In the optical semiconductor device equipped with a substrate, wiring formed on this substrate, the optical element carried on this wiring, and the translucency mould object which comes to carry out the mould of this optical element and some wiring the terminal which exposed said wiring to internal wiring covered with said translucency mould object, and the exterior of said translucency mould object -- business -- with external wiring It is the optical semiconductor device which consists of medium wiring which is formed so that the periphery part on the substrate of said translucency mould object may be avoided, and connects said internal wiring and external wiring for terminals, and is characterized by considering this medium wiring as solid wiring.

[Claim 3] The optical semiconductor device according to claim 1 or 2 characterized by having established the through hole which arrives at a rear face from the front face of said substrate in the location covered with the translucency mould object on said substrate, and forming said wiring in this through hole.

[Claim 4] The number of said through holes is an optical semiconductor device according to claim 3 characterized by being more than the number of said wiring.

[Claim 5] The optical semiconductor device according to claim 1 or 2 characterized by having formed the crevice in the field which counters the periphery part of the translucency mould object of said substrate, and forming said wiring in this crevice.

[Claim 6] a through hole is formed in a substrate and a rear face is arrived at from the front face of a substrate -- as -- the inside of said through hole, and a substrate top -- a mould -- public funds -- the manufacture approach of the optical semiconductor device characterized by forming wiring so that the edge of the cavity of a mold may be avoided, carrying an optical element on wiring, pouring in translucency mould material into the cavity of a mold clamp meal and said metal mold on both sides of said substrate with said metal mold, and carrying out the mould of said optical element.

[Claim 7] So that a through hole may be formed in a substrate and a rear face may be arrived at from the front face of a substrate in said through hole and on a substrate Wiring

is formed so that the edge of the cavity of the metal mold for moulds may be avoided. An optical element is carried on wiring and said substrate is pinched with said metal mold. A mold clamp meal, The manufacture approach of the optical semiconductor device characterized by pouring in translucency mould material into the cavity of said metal mold through the breakthrough which arrives at the front face of said substrate from the runner for translucency mould material impregnation formed in the rear face of said substrate, and carrying out the mould of said optical element.

[Brief Description of the Drawings]

[Drawing 1] The optical semiconductor device concerning 1 operation gestalt of this invention is shown, and it is (a). A bottom view and (b) A top view and (c) A side elevation and (d) Sectional view

[Drawing 2]The optical semiconductor device when similarly giving plating wiring is shown, and it is (a). A top view and (b) (a) B-B sectional view

[Drawing 3]The optical semiconductor device when similarly carrying out a mould is shown, and it is (a). A top view and (b) (a) B-B sectional view

[Drawing 4] Drawing showing the substrate and metal mold in the case of transfermold shaping similarly

[Drawing 5] The top view of the optical semiconductor device of a multiple-string configuration

[Drawing 6] The optical semiconductor device which has three plating wiring is shown, and it is (a). A top view and (b) Bottom view

[Drawing 7]The perspective view of the optical semiconductor device in front of the mould which has plating wiring formed in the vertical angle

[Drawing 8] Drawing showing the modification of an optical semiconductor device

[Drawing 9]The optical semiconductor device by other manufacture approaches is shown, and it is (a). A bottom view and (b) A top view and (c) are a side elevation and (d). Sectional view

[Drawing 10]Similarly the optical semiconductor device in a manufacture process is shown, and it is (a). A top view and (b) (a) B-B sectional view

[Drawing 11]Similarly the optical semiconductor device in a manufacture process is shown, and it is (a). A top view and (b) (a) B-B sectional view

[Drawing 12] Drawing showing the impregnation approach of translucency resin

[Drawing 13] Drawing showing the impregnation approach of translucency resin

[Drawing 14]The conventional optical semiconductor device is shown and it is (a). A bottom view and (b) A top view and (c) A side elevation and (d) Sectional view

[Drawing 15]The optical semiconductor device when similarly giving plating wiring is shown, and it is (a). A top view and (b) (a) B-B sectional view

[Drawing 16]The optical semiconductor device when similarly carrying out a mould is shown, and it is (a). A top view and (b) (a) B-B sectional view

[Drawing 17] Drawing showing the substrate and metal mold in the case of transfermold shaping similarly

[Description of Notations]

1 Substrate
2 Plating Wiring
3 Optical Element
4 Translucency Mould Object
6 Through Hole
9 Metal Mold
10 Cavity
13 Crevice
21 Runner
22 Breakthrough

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the optical semiconductor device of a surface mounting mold.

[0002]
[Description of the Prior Art] Conventionally, as an optical semiconductor device of the above-mentioned surface mounting mold, as shown in drawing 14 , the plating wiring 32a and 32b of a couple was formed on the substrate 31, and each plating wiring 32a and 32b has arrived at the rear face through the side face from the front face of a substrate 31, for example. On plating wiring 32a, a light emitting device or a photo detector (only henceforth [when naming generically] "an optical element 34") is carried, and, as for this optical element 34, while it was formed in the crevice 33 of a substrate 31 is connected to plating wiring 32b of another side. And the translucency mould object 35 by which the mould was carried out with translucency resin is formed in the perimeter of an optical element 34, and lens 35a for raising the condensing nature of an optical element 34 is formed in this upper part.

[0003] If the manufacture approach of the above-mentioned optical semiconductor device is briefly explained with reference to drawing 15 and 16, two or more holes 36 used as the side face when item-izing this optical semiconductor device will be first formed on the substrate 31 which has multiple-string composition. Subsequently, the plating wiring 32a and 32b with which gold plate etc. was performed is formed so that the rear face of a substrate 31 may be arrived at through a hole 36 from the front face of a substrate 31. With conductive resin, die bonding of the optical element 34 is carried out to plating wiring 32a formed in the crevice 33 of a substrate 31, it is carried in it, wirebonding is carried out by the gold streak 37, and it connects with plating wiring 32b. And as shown in drawing 16 , the translucency mould object 35 is formed by transfermold shaping by translucency resin, such as an epoxy resin. Since the substrate 31 serves as a multiple string all around as shown in this drawing, carry out the dicing of it along the division line L, and let it be an independent optical semiconductor device as shown in drawing 14 .

[0004]
[Problem(s) to be Solved by the Invention] Drawing 17 is drawing showing the substrate and the metal mold for moulds at the time of transfermold shaping. Usually, in case transfermold shaping is carried out, a substrate 31 is set on female mold 38b of metal mold 38, and is held down by punch 38a of metal mold 38 from the upper part. And in the cavity 39 of metal mold 38, translucency resin is poured in and the translucency mould object 35 is formed.

[0005] In the case of eye this mold clamp, it is drawing 17 (b). The edge of the cavity 39 of punch 38a of metal mold 38 contacts the plating wiring 32a and 32b, and the front face of a substrate 31 or the plating wiring 32a and 32b may be made to produce a level difference with the pressure at the mold clamp time, the temperature of metal mold 38, etc. so that it may be shown (refer to the C section of drawing 17 (b)). Thereby, the plating wiring 32a and 32b receives a serious damage.

[0006] Then, in order to mitigate the damage of such plating wiring 32a and 32b, it is possible to make the pressure at the mold clamp time low. However, if the pressure at the mold clamp time is made low, in case translucency resin is poured in into a cavity 39, translucency resin may leak from the clearance between a substrate 31 and metal mold 38. Escaped translucency resin covers the plating wiring 32a and 32b, and the plating wiring 32a and 32b may stop and achieving the duty as an electrode. Therefore, lowering of a large yield is produced.

[0007] Moreover, in case this surface mounting type of optical semiconductor device is soldered to mounting substrates, such as OA equipment, heat stress joins the plating wiring 32a and 32b. Since each expansion coefficients of a substrate, plating wiring, and a translucency mould object differ, this is produced. By this heat stress, a damage may join a carrier beam part further in the damage of the plating wiring 32a and 32b, and a poor contact and an open circuit may be caused.

[0008] this invention -- the above-mentioned trouble -- taking an example -- a mould --

public funds -- it aims at offer of the optical semiconductor device which can prevent the damage to plating wiring [of a mold / a mold clamp], and its manufacture approach.

[0009]
[Means for Solving the Problem] In the optical semiconductor device equipped with the translucency mould object with which the technical-problem solution means by this invention comes to carry out the mould of a substrate, wiring formed on the substrate, the optical element carried on wiring, an optical element, and some wiring, wiring avoids the periphery part on the substrate of a translucency mould object, and is formed.

[0010] or the terminal which exposed wiring to internal wiring covered with the translucency mould object, and the exterior of a translucency mould object -- business -- it forms so that the periphery part on external wiring and the substrate of a translucency mould object may be avoided -- having -- internal wiring and a terminal -- business -- it consists of medium wiring which connects external wiring, and medium wiring is considered as solid wiring.

[0011] The through hole which arrives at a rear face from the front face of a substrate is established in the location covered with the translucency mould object on a substrate, and, specifically, wiring is formed in a through hole. In this case, the number of through holes should just be more than the number of wiring. Moreover, a crevice may be formed in the field which counters the periphery part of the translucency mould object of a substrate, and wiring may be formed in the crevice.
[0012] according to these configurations -- a mould -- public funds -- the edge of the cavity of a mold stops touching wiring on a substrate Therefore, a damage is not given to wiring even if it carries out [mold clamp] of the substrate with metal mold at the time of transfermold shaping.

[0013] moreover, the manufacture approach of the optical coupling equipment of this invention forms a through hole in a substrate, and arrives at a rear face from the front face of a substrate -- as -- the inside of a through hole, and a substrate top -- a mould -- public funds -- it is the approach of forming wiring so that the edge of the cavity of a mold may be avoided, and carrying an optical element on wiring, pouring in translucency mould material into the cavity of a mold clamp meal and metal mold on both sides of a substrate with metal mold, and carrying out the mould of the optical element.

[0014] Moreover, through the breakthrough which arrives at the front face of a substrate as an approach of carrying out the mould of the optical element from the runner for translucency mould material impregnation formed in the rear face of a substrate, translucency mould material is poured in into the cavity of metal mold, and it may be made to carry out the mould of the optical element.

[0015]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained to a detail with reference to an accompanying drawing.

[0016] Drawing showing the optical semiconductor device which drawing 1 requires for 1 operation gestalt of this invention, drawing 2, and 3 are drawings showing the optical semiconductor device in the manufacture process of this optical semiconductor device. With reference to this drawing, this surface mounting type of optical semiconductor device has the solid substrate 1, plating wiring 2a formed on that substrate 1 and 2b (henceforth [when naming generically] "the plating wiring 2"), the optical element 3 carried on plating wiring 2a, and the translucency mould resin object 4 which comes to carry out the mould of some of optical elements 3 and plating wiring 2.

[0017] The substrate 1 is formed injection molding resin ingredients, such as a liquid crystal polymer, or by carrying out drilling processing of the glass epoxy. Crevice 1a for optical element 3 loading is prepared in the front-face side of a substrate 1.

[0018] The perimeter of an optical element 3 is covered with the translucency mould object 4 by which the mould was carried out by translucency resin with transfermold shaping. The upper part of the translucency mould object 4 is set to lens 4a for raising the condensing nature of an optical element 3.

[0019] And two through holes 6a and 6b (henceforth [when naming generically] "a through hole 6") which arrive at a rear face from the front face of a substrate 1 are established in the location covered with the translucency mould object 4 on a substrate 1.

[0020] Couple formation of the plating wiring 2 is carried out by electrolytic plating or electroless deposition. One plating wiring 2a consists internal wiring which reaches surface through hole 6a from the inner surface of crevice 1a, and the inside of through hole 6a of medium wiring which arrives at a rear face from a front face, and external wiring which reaches the front face located in the exterior of the translucency mould resin object 4 through a hole 7 from a rear face. Internal wiring is covered with the translucency mould resin object 4, and by exposing external wiring to the exterior of the translucency mould resin object 4, plating wiring 2a avoids the periphery part of the translucency mould resin object 4, and is formed. The same is said of plating wiring 2b of another side. In addition, by plating a crevice 1a inner surface, it becomes a reflector and condensing nature becomes good.

[0021] The plating wiring 2 stops thus, touching the periphery part on the substrate 1 of the translucency mould object 4 by leading the plating wiring 2 to a rear face from the front face of a substrate 1 through two through holes 6 (refer to the A section of drawing 1). namely, the time of transfermold shaping being carried out -- a mould -- public funds -- the edge of the cavity of a mold stops contacting the plating wiring 2 Thereby, receiving a damage of the plating wiring 2 from metal mold is lost, and producing nonconformities, such as a poor contact of the plating wiring 2 and an open circuit, is lost.

[0022] Moreover, since the edge of metal mold does not touch the plating wiring 2, the pressure of eye a mold clamp of metal mold can be put enough. Therefore, since the

leakage of the translucency resin from the clearance between a substrate 1 and metal mold can be prevented, generating of the resin weld flash on the plating wiring 2 by escaped resin can be suppressed, and poor soldering at the time of carrying out surface mounting of this optical semiconductor device can be lost. Therefore, since it is not influenced by the mold clamp pressure of metal mold in the case of transfermold shaping, a mould can be carried out in the basis of a under [large conditions], as a result the yield in production of an optical semiconductor device can be raised.

[0023] Next, the manufacture approach of this optical semiconductor device is explained with reference to drawing 2 -5. In addition, drawing 2 and 3 show the optical semiconductor device which has multiple-string composition all around. First, two or more holes 7 used as the side face when item-izing this optical semiconductor device are formed on a substrate 1. Moreover, two or more through holes 6a and 6b of a couple are formed in the location covered with the translucency mould object 4 on a substrate 1. Subsequently, the plating wiring 2 is formed so that the rear face of a substrate 1 may be arrived at through a through hole 6 from the front face of a substrate 1. With conductive resin, die bonding of the optical element 3 is carried out to crevice 1a of substrate 1 front face, it is carried in it, and it connects with plating wiring 2b by carrying out wirebonding by the gold streak 5. And as shown in drawing 3 , translucency resin, such as a thermosetting epoxy resin, is used for the perimeter of an optical element 3, and the translucency mould object 4 is formed with transfermold shaping.

[0024] Drawing 4 is drawing showing the substrate 1 and the metal mold 9 for moulds at the time of transfermold shaping. Drawing 4 (a) It is held down and mold clamp carried out of the substrate 1 set on female mold 9b of metal mold 9 to punch 9a of metal mold 9 from the upper part so that it may be shown. At this time, the contact part with the metal mold 9 of a substrate 1 produces a level difference somewhat with the edge of the cavity 10 of metal mold 9 for the heat by the pressure of eye a mold clamp, and the temperature of metal mold 9 (refer to the C section of drawing 4 (b)). However, since the plating wiring 2 is formed so that the edge of the cavity 10 of the metal mold 9 on a substrate 1 may not be contacted, a damage does not join the plating wiring 2.

[0025] As the impregnation approach of translucency resin, as shown in drawing 5, translucency resin is poured in by the gate 12 which branched from the runner 11 formed in the location between each plating wiring 2 on a substrate 1, and the runner 11, for example. Since the substrate 1 serves as a multiple string all around as shown in drawing 3 , after that, the dicing of it is carried out along the division line L, and it serves as an optical semiconductor device of an item as shown in drawing 1 .

[0026] By the way, although the number of the through holes 6 in the above-mentioned optical semiconductor device is the same number as the number of the plating wiring 2, it may make the number of through holes 6 fluctuate according to the number of the plating wiring 2. For example, what is necessary is just to increase the number of through holes according to the number of those plating wiring (electrode), when a drive circuit, and an amplifier (transistor etc.) circuit / arithmetic circuit are added and formed into 1 package by one optical element 3.

[0027] Drawing 6 is the top view of an optical semiconductor device when three plating wiring 2a and 2bs, and 2c are equipped to one optical element 3. When the electrode of the optical element 3 which has OPIC (Optoelectronic Integrated Circuit) turns into three electrodes of GND, VCC, and VOUT, for example according to this drawing, three through holes 6a, 6b, and 6c will be formed.

[0028] Moreover, what is necessary is just to form through holes 6a and 6b at the both ends of plating wiring 2a, when plating wiring 2a which carried the optical element 3 is prolonged in the direction of a vertical angle, as shown in drawing 7 . In this case, the number of through holes 6a and 6b increases more than the number of plating wiring 2a. Moreover, you may make it form two or more plating wiring in one through hole.

[0029] Drawing 8 is drawing showing the modification of the optical semiconductor device concerning this invention. The description of this optical semiconductor device is in the point of having established the crevice 13 in the field of the substrate 1 which counters the edge of the cavity 10 of metal mold 9. The plating wiring 2 stops thereby, touching the edge of the cavity 10 of metal mold 9. Therefore, since the damage by it is lost, the poor contact of the plating wiring 2, an open circuit, etc. can be prevented. In addition, since what is necessary is just to form the plating wiring 2 along a crevice 13, it becomes unnecessary to form the through hole 6 as shown in drawing 1 , and it can attain reduction-ization of a manufacturing cost.

[0030] Drawing 9 -11 are drawing showing other manufacture approaches of the optical semiconductor device concerning this invention. As the optical semiconductor device by this manufacture approach is shown in drawing 9 , the runner 21 for translucency resin impregnation is formed in the rear face of a substrate 1, and the breakthrough 22 is formed so that it may penetrate from this runner 21 to substrate 1 front face. It lets this runner 21 and breakthrough 22 pass, and translucency resin is injected into the cavity 10 of metal mold 9 at the time of transfermold shaping.

[0031] Although the runner for translucency resin material impregnation was prepared in the female mold of metal mold and translucency resin was poured in through this runner in the former, a contact side with the substrate 1 of the female mold of metal mold can be thoroughly made into a flat by forming a runner 21 in a substrate 1 side. Therefore, in case a substrate 1 is put at the time of transfermold molding, breakage is not exerted on the plating wiring 2.

[0032] If the manufacture approach of this optical semiconductor device is concretely explained with reference to drawing 10 and 11, two or more holes 7 used as the side face when item-izing this optical semiconductor device will be first formed on the substrate 1 with which the runner 21 is formed. Moreover, two or more through holes 6 of a couple are formed in the location covered with the translucency mould object 4 on a substrate 1. Subsequently, the breakthrough 22 which arrives at the front face of a substrate 1 from a runner's 21 crowning is formed.

[0033] Next, plating wiring 2a and 2b are formed so that they may arrive at the rear face of a substrate 1 through two or more through holes 6a and 6b. In addition, a breakthrough 22 may be formed after plating wiring 2a and 2b are given. Subsequently, with conductive resin, die bonding of the optical element 3 is carried out to crevice 1a of the front face of a substrate 1, it is carried in it, wirebonding is carried out by the gold streak 5, and it connects with plating wiring 2b. Then, translucency resin is injected into the cavity 10 of metal mold 9, and the translucency mould object 4 is formed. Impregnation of this translucency resin is performed through a breakthrough 22 from a runner 21. And as shown in drawing 11 , dicing is carried out along the division line L, and it considers as the optical semiconductor device of an item as shown in drawing 9 .

[0034] Moreover, the metal mold side runner 23 for translucency resin impregnation is formed in female mold 9b of metal mold 9 so that the edge may not touch the plating wiring 2, and you may make it form the breakthrough 24 which arrives at a front face from a rear face at a substrate 1 as an approach of pouring in translucency resin, as shown in drawing 12 . And translucency resin is poured in into the cavity 10 of metal mold 9 through a breakthrough 24 from the metal mold side runner 23.
[0035] Furthermore, as shown in drawing 13, the metal mold side runner 25 for translucency resin impregnation may be formed in female mold 9b of metal mold 9, and the metal mold side runner's 25 configuration may be prescribed that the edge is in agreement with the opening location of a through hole 6. If it does in this way, since translucency resin can be poured in into a cavity 10 through a through hole 6 from the metal mold side runner 25, it becomes unnecessary to form the breakthrough 24 shown in drawing 12 , and a manufacturing cost can be reduced.

[0036] In addition, this invention is not limited to the above-mentioned operation gestalt, and can add many corrections and modification to the above-mentioned operation gestalt within the limits of this invention.

[0037]
[Effect of the Invention] as mentioned above, the thing for which according to this invention the periphery part on the substrate of a translucency mould object is avoided, and wiring formed on a substrate is formed -- a mould -- public funds -- since the damage of wiring with a mold can be lost, the poor contact of plating wiring and an open circuit can be prevented, and the optical semiconductor device which has high-reliability can be offered.

[0038] Moreover, since the edge of metal mold does not touch wiring and the pressure of eye a mold clamp of metal mold can be put enough, the leakage of the translucency resin from the clearance between a substrate and metal mold can be prevented, and poor soldering at the time of carrying out surface mounting of this optical semiconductor device can be lost. Therefore, since it is not influenced by the mold clamp pressure of metal mold in the case of mould shaping, a mould can be carried out in the basis of a under [large conditions], as a result the yield in production of an optical semiconductor device can be improved.